

S-E-C-R-E-T  
N-O F-O-R-E-I-G-N D-I-S-S-E-M

CIA/BI GS 66-20  
February 1966

VULNERABILITY OF SELECTED URBAN AREAS IN NORTH VIETNAM

I. Introduction

About 10 percent of the population of North Vietnam is urban. Slightly less than two-thirds of this urban population resides in the two largest cities, Hanoi (1961, estimated population, 650,000) and Haiphong (1961, estimated population, 375,000). The next 4 most populous cities, estimated as of 1961, are Thanh Hoa (80,000), Nam Dinh (70,000), Vinh (55,000), and Dong Hoi (55,000). These six cities and two centers of developing industry, Thai Nguyen (30,000) and Viet Tri (25,000), are the subject of this study (see Figure 1).

Selected target installations in the cities or their environs are located on accompanying 1:50,000 maps (Plates I through VIII), and descriptive data keyed to the installations appear on the map aprons.

Since many of the selected installations are located within relatively heavily built-up areas, inadvertent destruction of civilian residences and/or other nontarget buildings may occur in connection with air strikes. The degree of destruction from fire, whether spread by high explosive bombing or incendiary bombing, is generally related to: (1) the density of the buildings, or their "built-upness," a term used by the US Strategic Bombing Surveys on Japan,\* and (2) the combustibility of material used in the construction of the buildings.

II. Density of Buildings

The degree of "built-upness" in various areas of Hanoi and Haiphong is shown in the Built-up Area Density maps on Plates I and II. Similar maps are unavailable for the other six urban areas, but radar-return maps which give some indication of the location and density of buildings have been substituted on Plates III through VIII.

On the Built-Up Area Density maps of Hanoi and Haiphong, the density is described in terms of roof coverage in three categories: (1) densely built-up (over 40 percent roof coverage), (2) moderately built-up (20 percent to 40 percent roof coverage), and (3) sparsely built-up (5 percent to 20 percent roof coverage).

Some concept of the extent of damage which may occur in the different zones of built-upness in Hanoi and Haiphong may be gained by a comparison with information in the US Strategic Bombing Surveys. Figures 2, 3, and 4 are based on detailed measurements in selected Japanese cities. Figure 2 shows the percentages of built-upness and areas occupied in square miles for various functional categories. Figure 3 shows the percentages of damage in different zones of built-upness by functional categories; Figure 4 is a graphic complement of Figure 3. The Japanese experience may be used as a very rough guideline to an estimate of possible damage to the residential areas of Hanoi and Haiphong. Validation and further refinement of the estimate require detailed consideration of any significant differences in construction materials or types of ordnance used. (Figures 5 through 8 allow some visual comparison of dwelling density and building types in Japanese and North Vietnamese cities.)

\*A Report on Physical Damage in Japan, The US Strategic Bombing Survey, Physical Damage Division, June 1947.

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### III. Combustibility of Building Materials

The US Strategic Bombing Survey after analyzing Japanese building construction concluded that "only a few Japanese buildings were safe from fire and could effectively serve as area fire stops." A comparison of Japanese with Vietnamese construction indicates that the combustibility potential of Vietnamese buildings may be significantly less.

#### A. Japanese Buildings

The Bombing Survey describes the typical Japanese dwelling as one or two stories high with heavy wood sills and a wood or stone foundation without basement, 1-1/2 feet above ground level (see Figures 9 and 10). Wood frames were 4 by 4 inches and the rafters were often 4 by 6 inches. The roof was usually tile, set on mud-covered 1/2- to 2-inch wood sheathing over wood supports. Ceilings consisted of wide 1/4-inch wood boards loosely suspended on 2- by 2-inch supports. The floors were 1/2-inch boards covered by 2-inch rice-straw "tatami" mats except in hallways where 3/4-inch boards were used. Walls were made of bamboo laths thickly coated on both sides with natural-cement mud, and most exterior sides were weather-protected by a wide, 1/2-inch, unpainted lapboard. Interior partitions were either thin mud-bamboo, window frames with glass or paper, or thin panels of wood.

#### B. Vietnamese Buildings

Clay of excellent quality for making brick occurs in abundance near most of the urban areas in North Vietnam, and wood is relatively scarce. Brick is therefore probably the most widely used building material. Masonry construction, moreover, is dominant in at least the larger cities.\* Because of this fact, it has been generalized that the danger of conflagration in the larger Vietnamese cities is not great.\*\* It may be surmised, however, that the framing beams in the older houses are tinder-dry and would burn readily.

Buildings of masonry walls and tile roofs are most common in the French-built sections, which include administrative and cultural institutions and commercial and residential areas. The residences are typically detached, single-family dwellings situated in separate lots along broad, tree-shaded avenues, a condition which would minimize fire spread. Fire would be more likely to spread among the dwellings in the Chinese quarters of Hanoi and Haiphong which, although generally of masonry, are crowded together.

In contrast to these buildings, the traditional Vietnamese dwelling is a single-family, thatched-roofed structure of bamboo frame covered with plaster or bamboo mats (see Figures 11 and 12). It is highly inflammable. In Hanoi and Haiphong, such buildings are generally limited to small settlements in the outskirts. In the smaller cities, these thatched-roof huts are likely to occur also within the city proper, where they may be intermixed with masonry structures. Shacks made of corrugated iron and wood, as well as junks and sampans which line the canals in the Chinese quarter of Haiphong, are living quarters for thousands of inhabitants; these structures would be highly inflammable (see Figure 13).

\* Most of the North Vietnamese urban areas, however, are built on deltaic alluvial soils, which will not support great weight without special engineering. Few buildings exceed 4 or 5 stories in height.

\*\* NIS, North Vietnam, Section 25, Urban Areas, p. 25-2.

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Masonry construction is common in the workers' housing built in recent years in the vicinity of industrial installations such as at Thai Nguyen (see Figure 14); in new apartments such as those on the southern limits of Hanoi (see Figure 15); and in the major new industrial installations,\* in permanent army barracks, and in some large warehouses such as the steel-frame concrete warehouses located behind the Haiphong wharves.

#### IV. Functional Divisions

Vietnamese cities are more or less divided into functional divisions which may help to limit fire spread into residential zones, since selected targets are more likely to be grouped in nonresidential divisions (see Functional Divisions of Built-Up Areas on Plates I through VIII).

The distinct differences between functional divisions are most clear in Haiphong, where canals (which, in themselves, are firebreaks) partially delineate the six distinctive functional areas. The strip along the Cua Cam shoreline comprises the port area, including enterprises directly concerned with port activities. The central part of the city is composed of: (1) the commercial district and (2) the mixed residential and commercial division (the densely populated Chinese quarter) lying east of the bend of the Song (River) Tram Bac. South of the Chinese quarter is an almost exclusively residential division. The eastern and western parts of the city are industrial divisions.

A large number of selected installations are located on the island which is bordered on the south and east by the Song Tram Bac (see Plate II). The main residential divisions are isolated from the island and would not be threatened by fire spread from it.

Hanoi is less clearly divided, although five main functional divisions are present (see Plate I). The north-central section contains the Citadel, a military area. The east-central and northwest sections (the latter being generally west of the Citadel) were developed by the French. Both are chiefly residential, with some mix of governmental and institutional buildings. The northeast and southeast sections are mainly mixed residential-commercial areas, the northeast section, bounded on the north and west by the railroad line, being the oldest and most densely built-up part of the city.

In Hanoi the selected installation most definitively isolated from residential divisions is Installation No. 4, the Ministry of Defense, located in the Citadel.

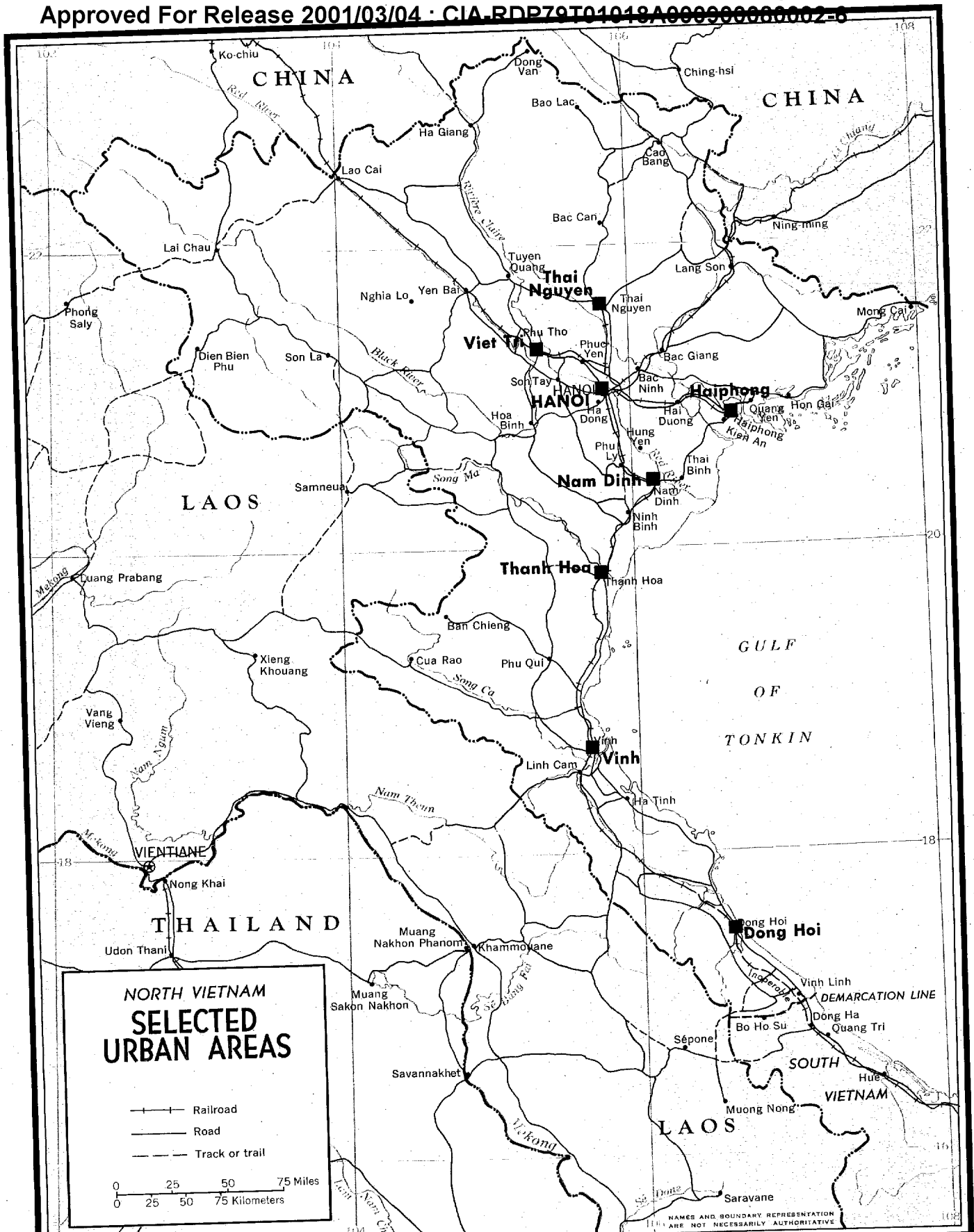
The location of installations with respect to functional divisions in the smaller urban areas can be ascertained by examination of the individual maps on Plates III through VIII.

\*An article on Vietnamese architecture in the Chinese-language periodical, Chien-chu Hsueh-pao (Journal of Construction), No. 11, 1963, pp. 24-29, describes the main structure of new North Vietnamese industrial complexes as being made of reinforced concrete, prefabricated or poured on the site. The roof is generally flat, of reinforced concrete, and in some cases insulated against heat. Secondary buildings in the industrial complexes may be of brick and wood construction and generally have tile roofs.

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Figure 1

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	Residen- tial <sup>1</sup>		Residen- tial <sup>2</sup>		Residen- tial <sup>3</sup>		Mixed residen- tial and industrial	
	Percentage built-up	Area	Percentage built-up	Area	Percentage built-up	Area	Percentage built-up	Area
Akashi <sup>4</sup>		.23		.85		.11		
Amagasaki	43.0	.91	29.8	1.90	16.5	.30	28.8	.35
Kawasaki	45.0	2.26	31.8	3.69	16.7	5.80	31.0	.37
Kobe	49.2	5.79	30.3	3.34	16.3	6.81	50.0	.54
Nagasaki	44.0	.75	30.0	1.43	12.0	.98	33.0	.06
Nagoya	39.4	4.98	31.1	12.78	17.4	12.65	30.4	1.97
Nishinomiya	49.2	.47	30.3	5.32	16.3	3.90	50.0	1.11
Osaka	43.0	20.88	29.8	17.94	16.5	5.85	28.8	3.92
Tokyo	46.0	22.50	30.9	53.84	16.6	63.89	30.3	7.39
Yokohama	44.5	2.02	31.2	6.50	11.0	6.14	32.5	.46
Unweighted average	45.0		30.6		15.5		35.0	
	Manufac- turing		Trans- portation		Storage		Total built-up area	
	Percentage built-up	Area	Percentage built-up	Area	Percentage built-up	Area		
Akashi <sup>4</sup>								
Amagasaki	37.7	2.47	9.0	.05	37.8	.17	6.15	
Kawasaki	43.4	5.19	14.9	.35	31.5	.59	18.25	
Kobe	44.9	1.55	9.3	.70	53.6	.69	19.42	
Nagasaki	46.0	.42	9.0	.04	29.0	.15	3.83	
Nagoya	40.0	6.49	8.3	.22	42.6	.64	39.73	
Nishinomiya	44.0	1.05	9.3	.06	53.6	.03	12.03	
Osaka	37.7	10.43	9.0	.78	37.8	3.11	62.91	
Tokyo	37.9	12.45	29.7	1.67	26.2	2.34	164.08	
Yokohama	33.6	1.54	27.7	.20	27.5	.92	17.78	
Unweighted average	40.6		11.0		37.6			

<sup>1</sup> Residential - Densely built up (10 percent and over).

<sup>2</sup> Residential - Moderately built up (20 to 40 percent).

<sup>3</sup> Residential - Sparsely built up (5 to 20 percent).

<sup>4</sup> Complete data not available.

Figure 2. Percentages of built-upness and areas occupied in square miles for certain Japanese cities.

City	Residential <sup>1</sup>	Residential <sup>2</sup>	Residential <sup>3</sup>	Manufacturing and residential	Manufacturing	Transportation	Storage
Akashi	92	37	88				
Amagasaki	29	11	0	39	12	0	0
Aomori	95	95	39				
Hachioji	100	90	19				
Kawasaki	79	51	9	69	19	12	33
Kobe	67	39	21	23	40	38	32
Nagoya	75	29	10	49	32	9	19
Osaka	53	8	8	20	18	8	18
Tokyo	76	40	40	33	17	10	21
Ube	56	42	4				
Yokohama	85	66	21	86	19	33	33
Unweighted average	73	46	23.5	45.5	22.5	15.5	22

<sup>1</sup> Residential - Densely built up (10 percent and over).  
<sup>2</sup> Residential - Moderately built up (20 to 40 percent).  
<sup>3</sup> Residential - Sparsely built up (5 to 20 percent).

Figure 3. Percentages of damage in different zones of built-upness.

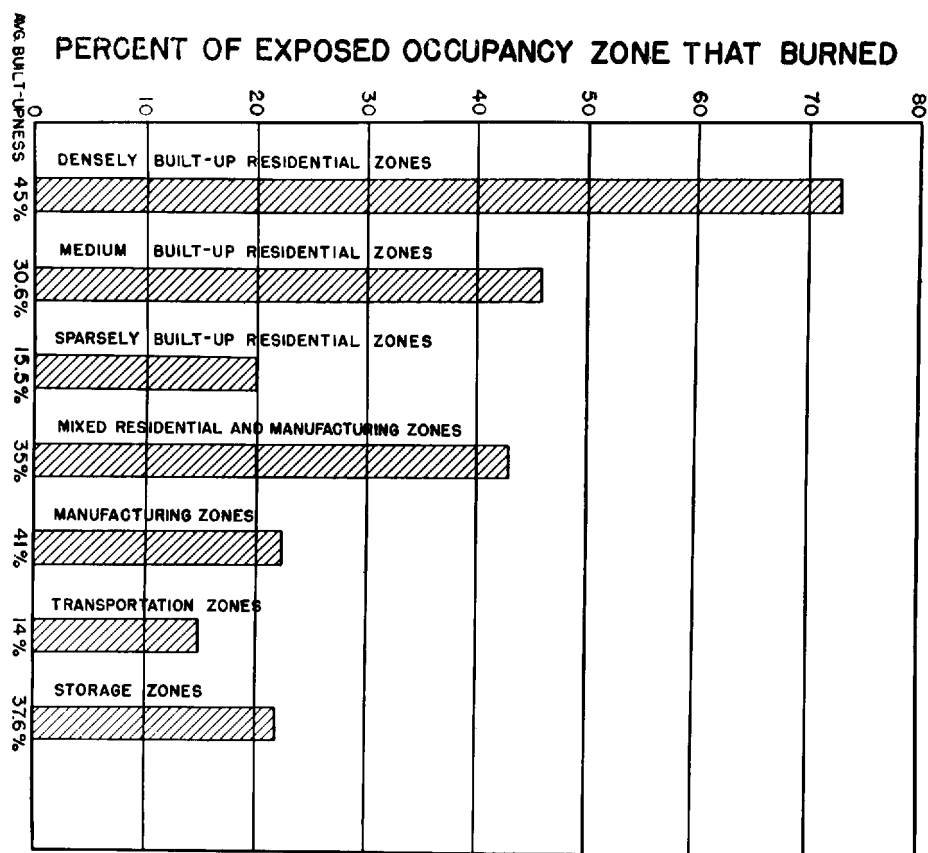


Figure 4. Graphically illustrates the data in Figures 2 and 3, showing the average percent of fire damage in 7 different functional zones.



Figure 5. Built-up area in Nagoya, Japan, showing fire resistant buildings interspersed among areas formerly occupied by combustible buildings.



Figure 6. Densely built-up Chinese quarter of Hanoi. Buildings are of masonry construction.





Figure 7. Typical densely built-up area of small Japanese city.



Figure 8. A view of Nam Dinh showing density and construction of buildings.



Figure 9. Japan. Combination one- and two-story mercantile structures with dwelling occupancy on second floor. Unpainted wood siding usually covered mud-filled walls.



Figure 10. Japan. Typical dwelling in smaller Japanese city.



Figure 11. Vietnamese dwellings near Thanh Hoa. The sides are of palm or bamboo mats and the roof is thatched. Such houses are generally on the outskirts of the larger cities but may be intermixed with masonry structures in the smaller urban centers.



Figure 12. Shows framework of typical thatched-roof Vietnamese dwelling in Vinh area. According to Soviet source of picture, house was being rebuilt after destruction by U.S. bombing.



Figure 13. The Chinese quarter of Haiphong borders the Song (River) Tram Bac. Many of the junks and sampans serve as homes.



Figure 14. Thai Nguyen. Cadre workers' apartments, of masonry construction.

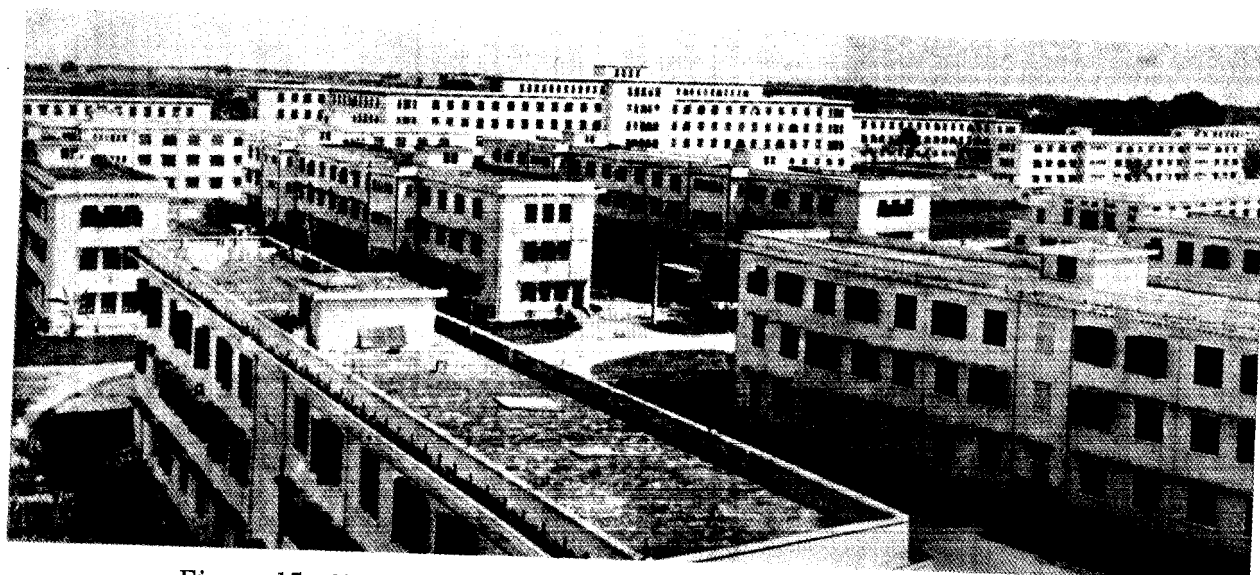
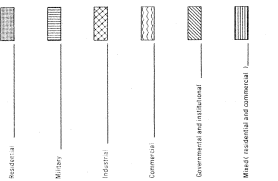
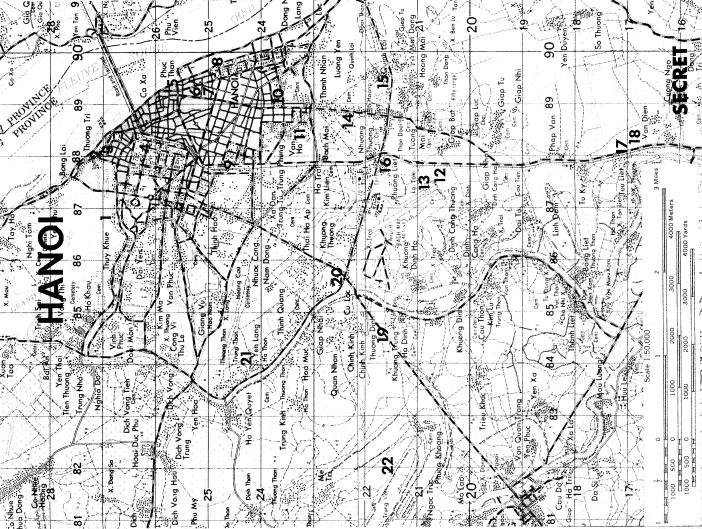
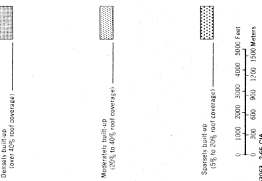


Figure 15. New apartments, of masonry construction, on the southern outskirts of Hanoi.

FUNCTIONAL DIVISIONS OF BUILT-UP AREA



BUILT-UP AREA DENSITY



PHASE I  
HANOI - SELECTED INSTALLATIONS  
Map Scale 1:50,000

- Map Number
1. Radio Intercept Research Section.
  2. Hanoi Thermal Power Plant. Largest thermal power plant in North Vietnam. Only power plant in Hanoi. Capacity 2,150 kilowatts.
  3. City Waterworks.
  4. Ministry of Defense.
  5. Ministry of Communications Offices.
  6. Radio-Telegraph Office.
  7. PTT (Post Office-Telephone-Telegraph) building (UDC offices are adjacent to this building).
  8. Hanoi Port Facilities. Transshipment point for raw materials and finished products. Major traffic is barges and lighters; vessels exceeding 10.5 meters are not permitted in this port. Estimated 12.5 acres of covered storage area.
  9. Hanoi Airfield. Facilities include passenger station, freight terminal building, 2 car repair shops, 12 storage buildings, 15 miscellaneous buildings.
  10. Alcohol Distillery.
  11. Hanoi Machinery Works, Tran Hung Dao. One of 2 largest engineering plants in North Vietnam.
  12. Hanoi Storage Area Bac Mai Airfield. 70 buildings.
  13. Hanoi Army Barracks, Bac Mai Airfield. Capacity 4,000 men. 110 buildings.
  14. Hanoi Army Barracks, South Quinh Loi. Capacity 10,000 men. 117 buildings.
  15. Hanoi Army Supply Depot, South Quinh Loi. 252 buildings. Significantly close to Hanoi/Bac Mai Airfield.

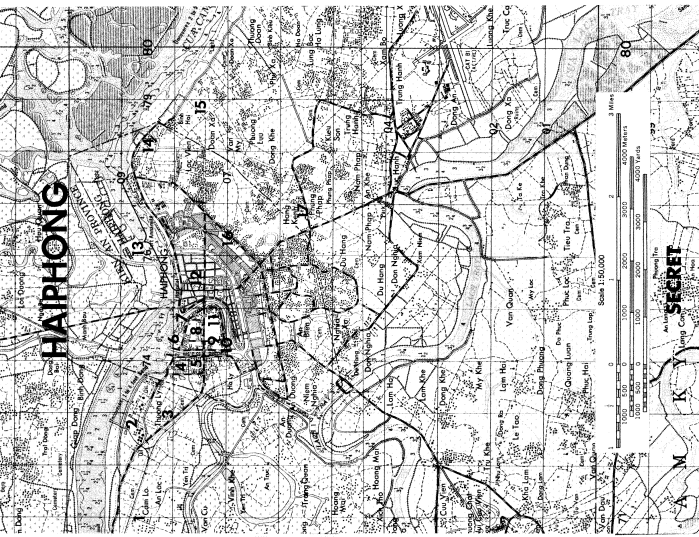
Map Number

- Installation
16. Hanoi Petroleum Products Storage Area Bac Mai. Largest storage area in Hanoi. Capacity 1,450,000 gallons.
  17. Van Dien Motor Vehicle Storage and Repair Shops. 60 buildings. Vehicles are not be quickly delivered to Hanoi military installations.
  18. Van Dien Army Supply Depot. One of largest storage complexes in North Vietnam. Storage capacity estimated 800,000 square feet. 291 buildings. Located south from Hanoi. Principal lines of communication leading south from Hanoi.
  19. Hanoi Motor Vehicle and Machine Tool Plant. Largest machine building plant in North Vietnam, producing 60 percent of national output of machine tools.
  20. Hanoi Rubber Products Plant. Largest single rubber products plant in North Vietnam. Destruction would significantly reduce North Vietnam's production of automobile and cycle tires.
  21. Hanoi/Air Army Barracks, West Yen Lang. Capacity 9,500 men. 196 buildings.
  22. Hanoi Radio Broadcasting Station No. 71. Contains transmitting facilities of Radio Hanoi; also contains receiving facilities of radio stations of the Chinese Army point-to-point radio network. Located off map -- 3 miles NW of Hanoi/Bac Mai Airfield.

Installations Not Included In Map Area

- Hanoi Radio Transmission Station, Dai Ng.  
Principal point-to-point 1971. Working station in North Vietnam for domestic and international communications.  
Located off map -- 4 miles west of Hanoi/Bac Mai Airfield.  
Hanoi Petroleum Products Storage, Thanh An  
About 24 miles NE of Hanoi. Principal fuel storage area supporting the Hanoi complex. Capacity 10,000,000 gallons.





Installation

1. Haiphong Radio Communication Station International. Only reported international radio facilities other than Hamdi; no other international radio facilities reported. Station and government communications in event of loss of the Hamdi capability.
2. Haiphong Petroleum Storage Area. Most important POL storage area in North Vietnam. Total POL storage capacity, 22,350,000 gallons. Destruction of installation would reduce North Vietnam's POL storage capability by 40%.
3. Haiphong Railroad Fuel West. Probably a holding yard for rail tank cars. Destruction would severely hamper distribution of POL from adjacent tank farm.
4. Haiphong Cement Plant. One of largest Portland cement producers in SEA. Installed annual capacity 400,000 metric tons; effective annual production 300,000 metric tons. Communist China receives most of the exported cement.
5. Haiphong Thermal Power Plant (Cement Plant). Second largest power plant in the Hanoi area -- capacity 10,000 Kw. Supplies power to Haiphong Cement Plant and adjacent urban areas.
6. Haiphong Railway #1 Dancette. One of two main construction yards in Haiphong. (See installation No. 1). Has done repair work on ocean-going vessels and dredges.
7. Haiphong Naval Basin. Primary naval base in North Vietnam; its destruction would hamper operating effectiveness of North Vietnam's short range coastal craft.
8. Barracks and Motor Pool.
9. Chemical Plant.
10. Haiphong Ship Repair Yard #3 Storage. One of two main ship repair yards in Haiphong. (See installation No. 4). Has constructed 200 h.p. tugboats and does repair work on private and government boats.

Installation

11. Artillery Headquarters.
12. Military Headquarters.
13. Haiphong Post Facilities. Largest and most significant port in North Vietnam, handling 80% of the country's ocean shipping including about 80% of all imports (5% of the POL) and 70% of all exports.
14. Haiphong Thermal Power Plant. Capacity 6300 Kw.
15. Haiphong Military Region Headquarters, Left Bank. Includes the headquarters of the Left Bank Military Zone which covers most of northern North Vietnam. Area contains 34 buildings.
16. Haiphong Railroad Station Classification Yard and Shops. Main transshipment point for goods entering and leaving Haiphong and particularly for shipment to Hanoi. Destruction would hamper movement of supplies and repair of locomotives and rolling stock.
17. Transmitter Station.

## PLATE III

## THANH HOA - SELECTED INSTALLATIONS

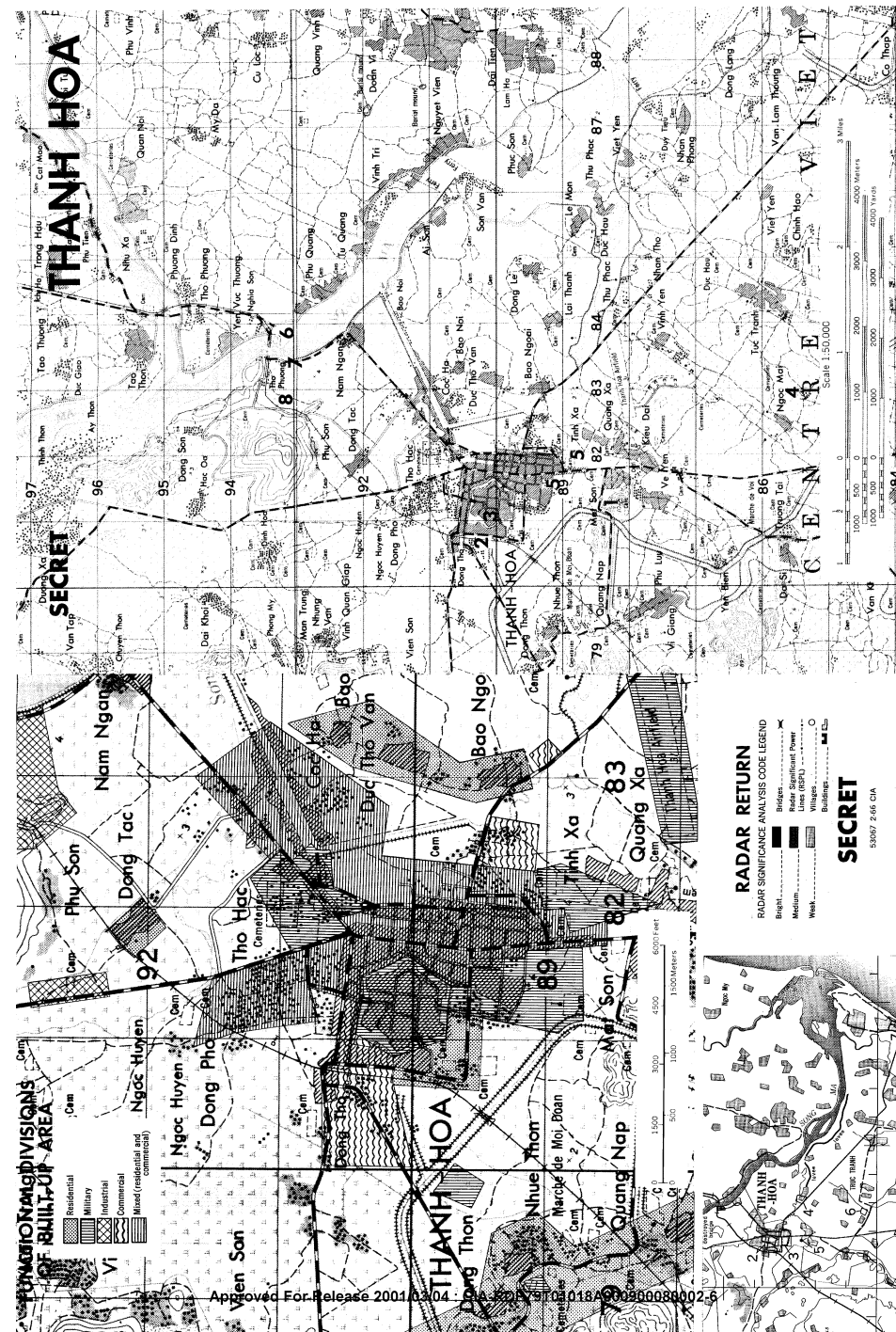
Map Scale 1:50,000

## Installation

## Map Number

- 1 Petroleum Products Storage.  
Two cylindrical tanks with estimated capacity of 500,000 gallons.
- 2 Railroad Station and Yards.  
Facility includes passenger station, 7 repair buildings, 6 storage buildings, and 13 support buildings.
- 3 Military Radio Communications Station.  
Installation includes antenna field and transmission area with 6 buildings.
- 4 Army Barracks South-Southeast, Tuc Tranh.  
10 barracks and 3 support buildings.
- 5 Thanh Hoa Army Barracks and Supply Depot.  
Major element of Thanh Hoa military complex; second only to Vinh in importance in southern North Vietnam. It occupies an area of 19,000 men in 14 barracks, 6 communication buildings, 14 storage buildings, 85 support buildings.
- 6 Railroad Terminal Facilities, Ham Rong.  
Installation includes terminal and 2 warehouses. Area heavily bombed as of 21 July 1965; facilities damaged.
- 7 Thanh Hoa Port Facilities and Warehouse Area.  
Installation has diminished in importance since new rail line opened to Vinh, but still believed to be closely linked to flow of military supplies to the south. 23 storage buildings and 38 support buildings. As of 21 July 1965, 22 buildings destroyed or dismantled and 12 damaged.
- 8 Power Plant  
Provides electric power for Thanh Hoa military complex as well as local commercial and agricultural users. As of 6 August 1965, transformer yard destroyed and boiler house severely damaged.

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## PLATE IV

## NAM DINH - SELECTED INSTALLATIONS

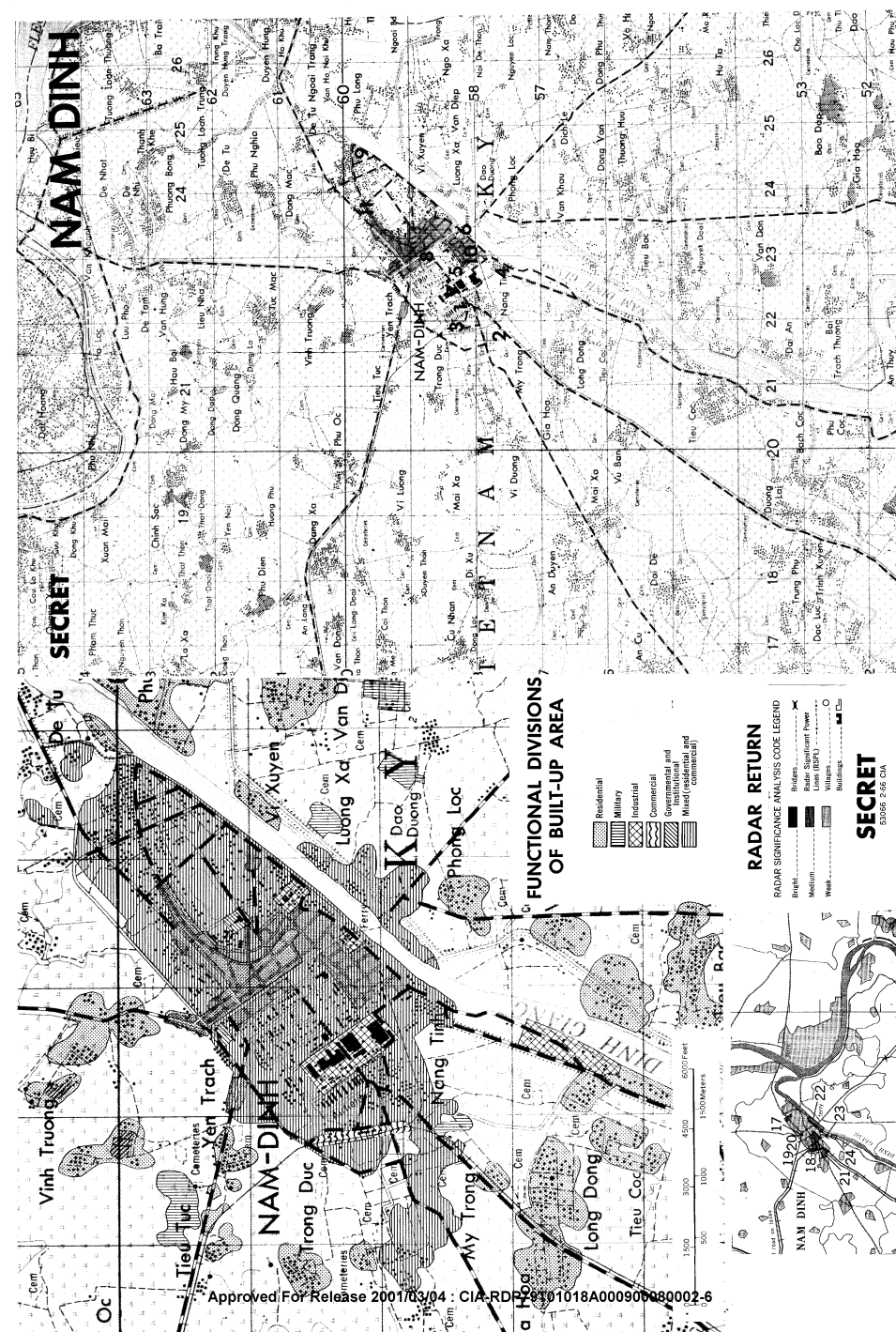
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## Installation

## Map Number

- 1 Army Barracks and Storage Depot, West.  
Troop capacity, 950 men in 20 barracks. Storage capacity, 27,500 square feet in 11 buildings.
- 2 Army Barracks, Southwest.  
76 buildings.
- 3 Railroad Yard.  
Serves the industrial and commercial center of Nam Dinh. Facility includes 2 freight sheds and passenger station.
- 4 Petroleum Products Storage.  
Facility provides storage for petroleum products for military and civilian installations in lower Tonkin Delta.  
11 tanks with capacity of 2,183,000 gallons.  
Installation destroyed.
- 5 Thermal Power Plant.  
Capacity 7,500 kilowatts, comprising over 4 percent of national capacity. As of 6 August 1967, all target elements either destroyed or damaged. Plant probably inactive.
- 6 Port Facilities.  
Minor river port serves only immediate area of Nam Dinh.  
25 storage and support buildings.
- 7 Textile Plant.  
multistoried buildings produce cotton, rayon, and silk textiles. As of 6 August 1967, 3 buildings moderately damaged.
- 8 Waterworks.
- 9 Waterworks.
- 10 Distillery.
- 11 Communication Service.

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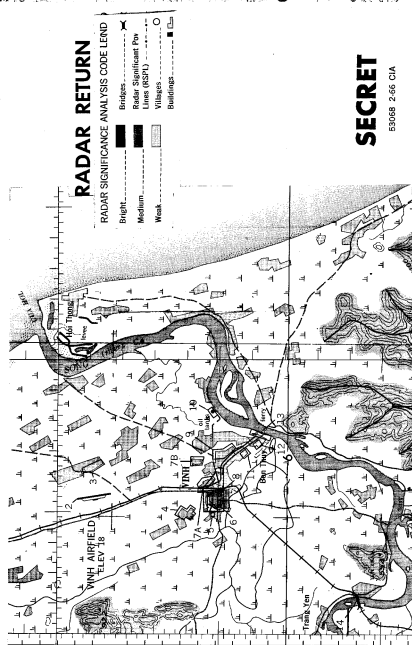
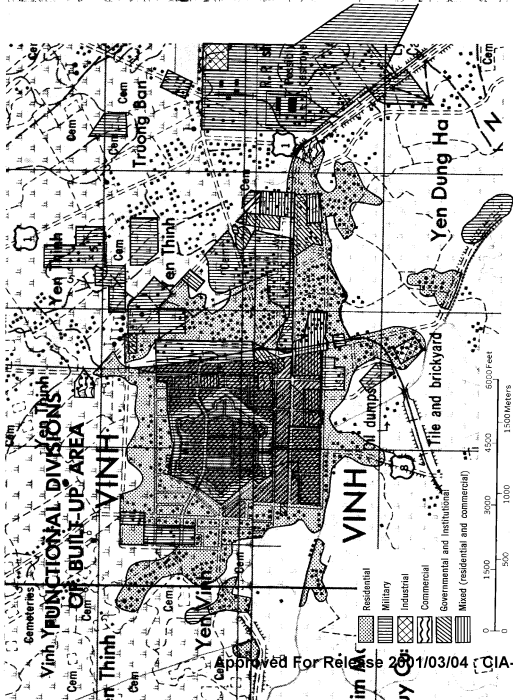
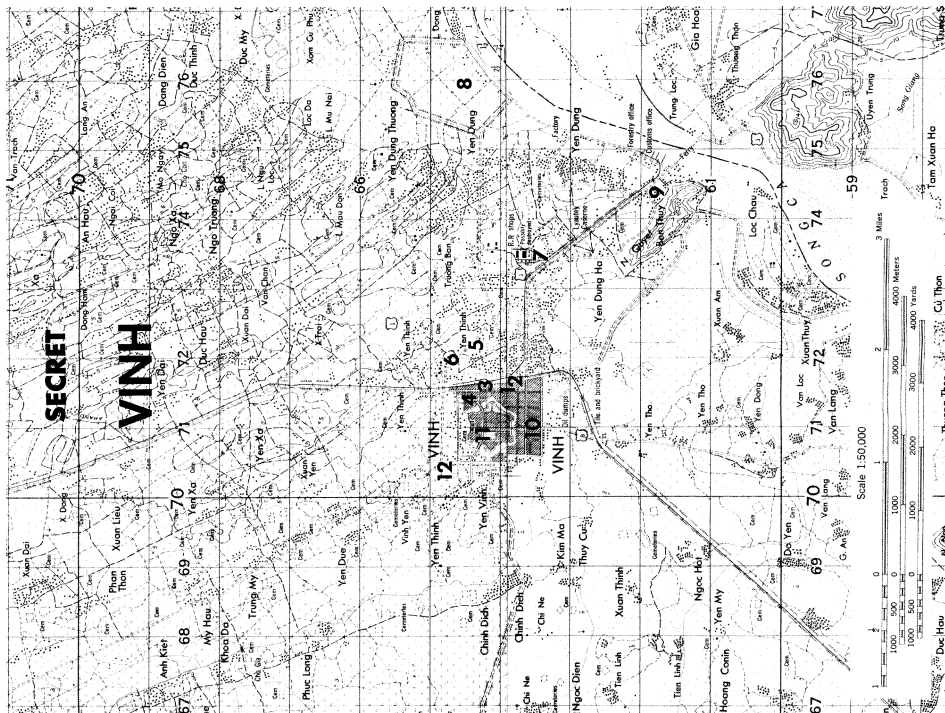
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PLATE V  
VINH - SELECTED INSTALLATIONS  
Map Scale 1:50,000  
Installation

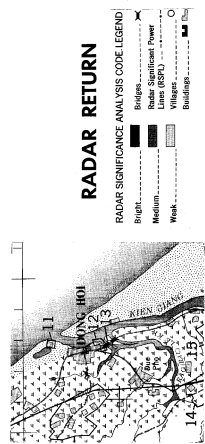
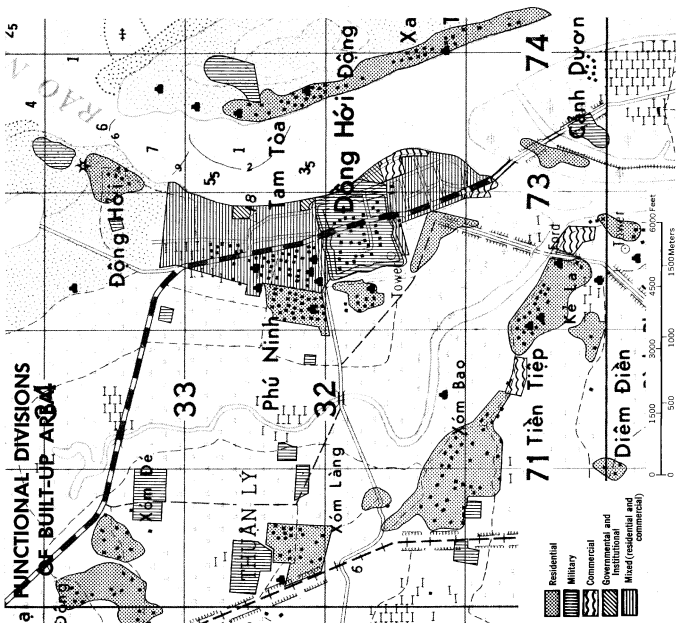
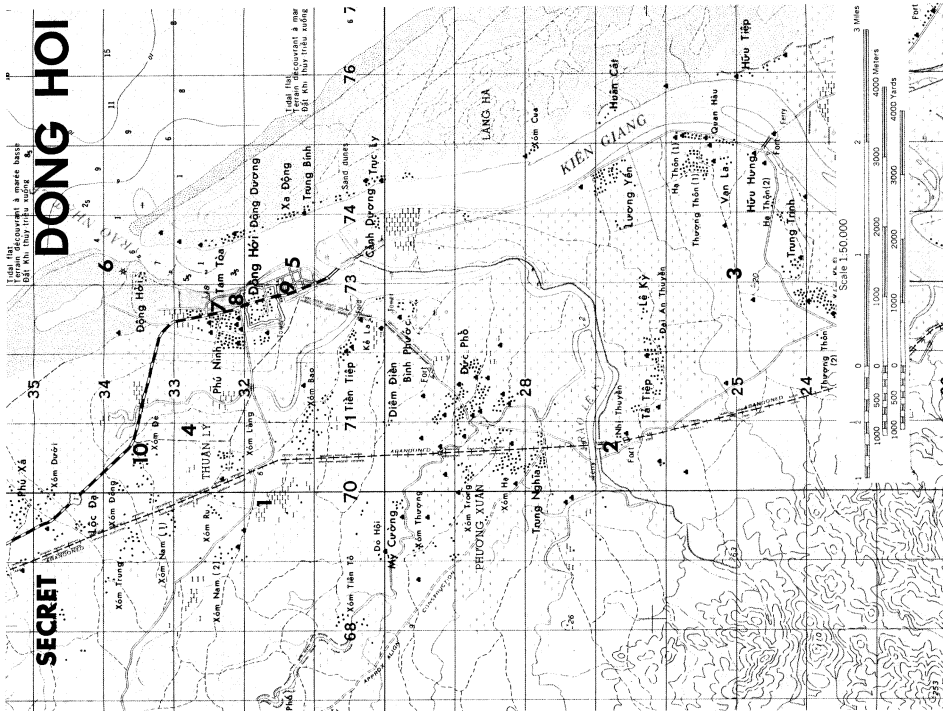
Map Number

- 1 Telegraph Office.
- 2 Security Station.
- 3 Railroad Equipment Reconditioning Shops.
- 4 Vehicle Repair Plant
- 5 Military College
- 6 Vinh Army Barracks Central Northeast  
Capacity 3,900 men. 64 buildings. As of 18 September 1965, a large number of the buildings were destroyed or severely damaged.
- 7 Vinh Army Barracks and Supply Depot East  
Capacity 9,400 men. 279 buildings. Most significant military center in southern North Vietnam. As of 2 October 1965, 67 buildings were destroyed, 18 severely damaged and 59 damaged.
- 8 Vinh Petroleum Products Storage  
Installation may be abandoned or serve only local users.
- 9 Ben Tuy Thermal Power Plant  
Provides power for the vital Vinh military/industrial complex, Ben Tuy harbor, and the irrigation pumping stations serving the SW portion of Nghe An province. As of 4 June 1965, the transformer house was destroyed and the boiler house severely damaged.
- 10 Open and Covered Storage Area.
- 11 Vinh Army Barracks Citadel  
Capacity 1,800 men. 80 buildings.
- 12 Vinh Army Barracks Northwest  
Capacity 1,800 men. 134 buildings. As of 24 September 1965, 75 buildings were destroyed, 30 severely damaged, and 58 destroyed.

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PLATE VI  
DONG HOI - SELECTED INSTALLATIONS  
Map Scale 1:50,000

Map Number

Installation

- 1 Dong Hoi Army Barracks, West-Northwest. Nearly all 200 buildings, including 10 barracks. Nearly all buildings either destroyed or damaged as of 7 October 1975. Installation may be deactivated.
- 2 Dong Hoi Army Barracks, Southwest. 10 buildings; can support a garrison of approximately 1,000 troops.
- 3 Huu Hung Army Training Area. Installation consists of vehicle and infantry training and testing areas and includes 2 buildings and communications tower.
- 4 Dong Hoi Headquarters, Demarcation Zone. Reportedly the control center for all DRV infiltration activities in the DMZ. 24 buildings.
- 5 Naval Base. Serves as base for operations and minor repair of patrol craft and training of crews.
- 6 Naval Barracks Area. 29 buildings.
- 7 Water Plant and Storage Tank.
- 8 FOI Storage Dump.
- 9 Power Plant.
- 10 Radio Communications Station. Installation probably serves as communication center for DRV infiltration activities in DMZ, which are reportedly controlled from the adjacent headquarters area. 5 buildings.

INSTALLATIONS NOT IN MAP AREA

Radio Station, Phuoc Loc. 5 miles northwest of Dong Hoi. Installation includes 3 buildings.

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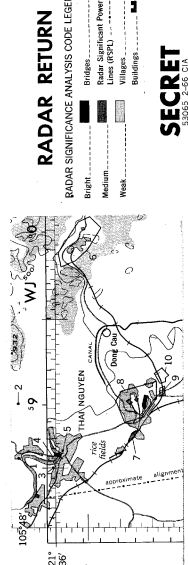
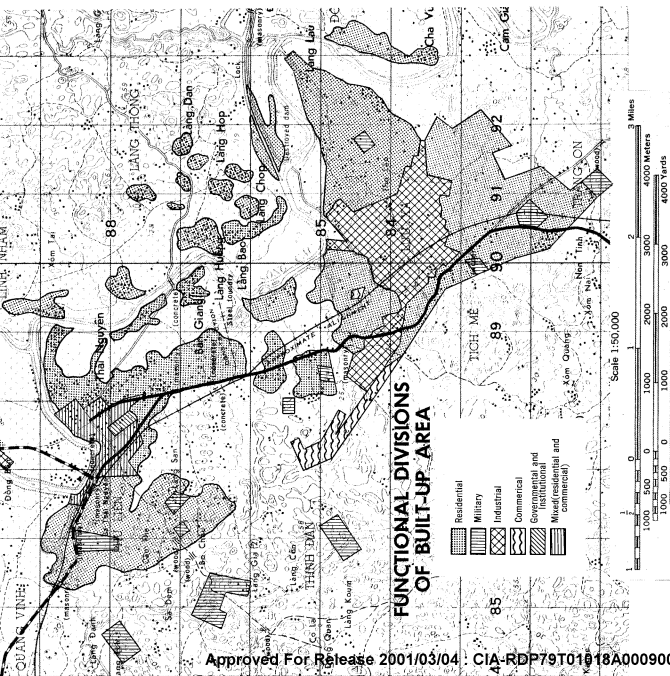
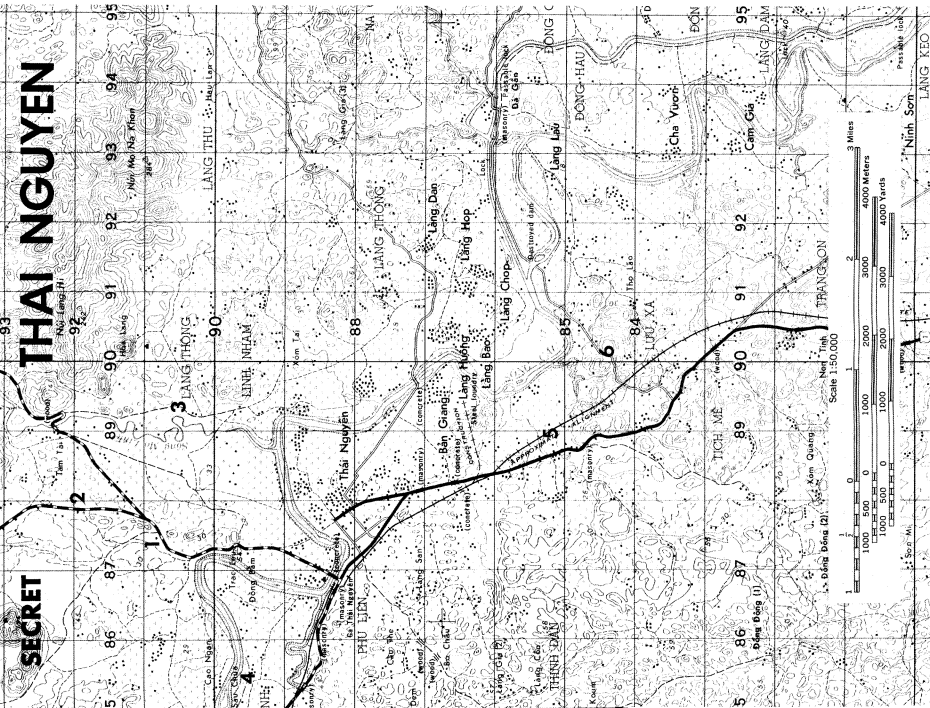
THAI NGUYEN - SELECTED INSTALLATIONS  
Map Scale 1:50,000  
Installation

Map Number

- 1 Thai Nguyen Army Barracks North and Headquarters Military Region Viet Bac.  
Installation is part of the defense force for the Thai Nguyen industrial complex and also houses the headquarters of the Viet Bac Military Region. Facilities contain 18 barracks and 30 support buildings.
- 2 Thai Nguyen Army Supply Depot North.  
Installation provides logistical support for the military installations supporting the Thai Nguyen industrial complex. Includes 36 warehouses with estimated storage capacity of 450,000 square feet. 3 administrative buildings, 5 support buildings.
- 3 Thai Nguyen Army Barracks Northeast.  
Installation includes 40 barracks, 5 administration buildings, 9 warehouses, 16 support buildings, and underground storage.
- 4 Thermal Power Plant.  
Produces about 14 percent of North Vietnam's national capacity. Capacity reported to be 24,000 kw but was to be increased to 36,000 kw in 1965.
- 5 Railroad Station, Yards, and Shops.  
Serves the iron and steel combine; destruction would reduce rail shipments of raw materials to the combine and of iron and steel products to all of North Vietnam.
- 6 Iron and Steel Combine.  
Largest iron and steel plant in North Vietnam. Now operating on limited basis; expected to produce 500,000 tons annually when completed -- 20 percent of the total national demand for iron and steel.

INSTALLATIONS NOT IN MAP AREA

Iron Ore Processing Plant.  
7 miles east of Thai Nguyen. Principal iron ore processing plant for the Thai Nguyen iron and steel combine.



VIET TRI - SELECTED INSTALLATIONS

Map Scale 1:50,000

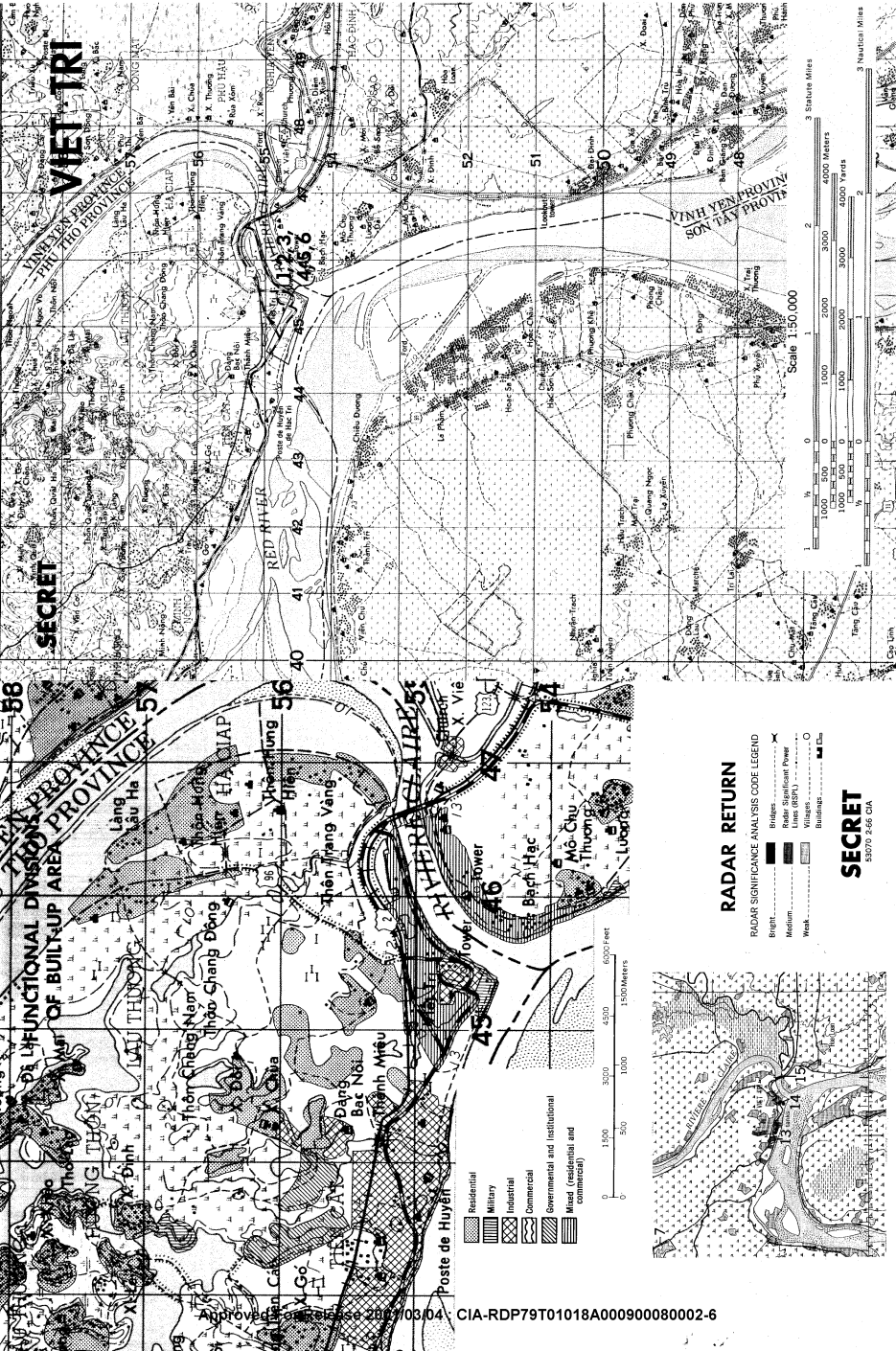
Installation

- 1 Viet Tri Petroleum Products Storage.  
Capacity 1,056,000 U.S. gallons. The primary POL supply for the Viet Tri industrial center.
- 2 Viet Tri Petroleum Products Storage No. 2.  
Capacity 1,240,000 gallons.
- 3 Viet Tri Chemical Plant.  
Annual production about 9,500 metric tons of chemical products. Produces 70 percent of the Viet Tri output of chlorine, hydrochloric acid, and sulfuric acid.
- 4 Viet Tri Sugar Refinery and Alcohol Plant.  
Capacity reported to be 7,500 metric tons per year. Built with Communist Chinese aid in 1960.
- 5 Viet Tri Thermal Power Plant  
Sole power source for Viet Tri industrial complex.  
Capacity, 16,000 kilowatts.
- 6 Viet Tri Paper Combine.

SECRET  
NO FOREIGN DISSEM

Map Number

- 1
- 2
- 3
- 4
- 5
- 6



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*PNB*

This particular copy of JTH's urban areas study is the 4th of four in which the radar return maps are in full color. The three copies which the requester received are the same. Jim wanted to be sure that you and Mr. Brammell know this. The remainder of the copies will have the same information in photocopy form.

P. O. E. 1400 2/10/66

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